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Trade-off or complement? Choices along ambidextrous paths from resource allocation through performance
從資源配置到績效之雙元能力途徑上的策略選擇

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Abstract: To adapt to the changing business environment, an incumbent manager must start by determining business objectives, based on which limited resources are allocated, and then follow up with actions that not only build but also serve to accumulate an effective and flexible capacity for ambidexterity, such that the firm's targets for short-term performance and long-term value can be reached. Drawing on data from the computer-based services industry in North America, this empirical study provides support for a causal pathway from resource deployment through exploration/exploitation configuration to performance. It also shows the coexistence of trade-offs and complementary mediating effects of exploration and exploitation between resource allocation and short- and long-term performance. To minimize the cost of trade-off effects between exploitation and exploration and, at the same time, maximize the benefits of complementary effects, ambidextrous strategic management involves an iterative process of dynamic capability which, with reconfiguration of exploration and exploitation as the central focal point, calls for the making and re-making of strategic choices between short-term and long-term goals and a complementary reallocation of resources.

Keywords: Ambidexterity, exploitation, exploration, strategic choice.

摘要：為因應變動的產業環境，經理人必須先進行主觀的目標選擇，再以此為基準，分配其有限資源，藉以建構及累積其探索與開發之能量，從而得以

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達成其長短期績效目標。本研究蒐集Compustat北美資料庫中電腦相關服務業之資料，進行檢定之結果支持資源配置透過探索與開發能力影響績效之假說。本研究實驗結果亦顯示，探索能力與開發能力對資源配置轉換長期與短期績效之過程，同時存在抵換效果與互補效果，雙元能力即為經理人之管理的一個循環的動態過程，以重構探索—開發混合能力的為核心，在長、短期績效目標及資源配置間不斷的重複進行決策。

關鍵詞：雙元能力、探索能力、開發能力、策略選擇

1. Introduction

There are spirited discussions in the previous research literature of how important it is for firms to be ambidextrous in balancing or orchestrating oft-conflicting dual alignments for long-term survival and prosperity in an ever-changing business environment (March, 1991; Tushman and O'Reilly, 1996; 2008; Raisch and Birkinshaw, 2008). Ambidexterity can be approached in a sequential, structural (simultaneous), or contextual way, but whichever is chosen, it always demands the adoption of certain courses of action and the allocation of resources necessary to carry out them out (Chandler, 1962: 13). Since the notion of organizational ambidexterity emerged in the 1980s, numerous theoretical and empirical papers have appeared on the topic, concentrating on aspects ranging from the constructs of ambidexterity, the relationship between ambidexterity and performance, and reasons for success and failure in achieving ambidexterity (O'Reilly III and Tushman, 2013). The effects of ambidexterity on relationships between performance and internal resource slack (Luo *et al.*, 2016) and on external resources such as strategic alliances (Lin, Yang, and Demirkan, 2007; Wassmer, Li, and Madhok, 2017) have also been verified. This paper aims to present a close-up view of the very basis of the duality of ambidexterity in order to analyse the trade-offs and/or complementary effects involved with the need, inherent in the implementation of ambidexterity, to respond to competing demands. In particular, this paper investigates the effects of resources being purposefully and separately deployed to each side of the dual alignment, including the effects of the duality on the short-term and long-term goals of the firm during various stages of implementation.

Ambidexterity building is affected by a series of strategic choices, on the part of those members of the organization who have the power to make them (Chandler, 1962; 1990), involving organizational goals (Chandler, 1962; Child, 1972), resource deployments (Grant, 1996), capability building (Teece, Pisano, and Shuen, 1997) and goal-modification. This paper develops a theoretical framework to demonstrate how resource configuration affects capacity building and to illustrate the transmission role played by ambidexterity from resource deployments through to short-term performance and long-term value.

This paper therefore contributes to the literature on ambidexterity by illustrating the management process from the moment of resource deployment, through the purposeful configuration of exploitation and exploration, and finally to targeted short- and long-term performance. This process is essentially circular and iterative. Using feedback from the outcome of resource deployment, adjustments can be made to all or parts of a bundle containing resources, the exploitation-exploration configuration, and short- and long-term goals. The results of the empirical study show that strategic choices do not rest solely on the efficient deployments of various resources (Sirman *et al*., 2011); they are also found in the choice between short-term and long-term goals, and the dual configuration of exploration and exploitation.

2. Theoretical background

Organizational ambidexterity argues that for a firm to survive, it cannot merely rely on effectively managing its existing business alone; it must at the very same time pursue a long-term strategy to build, outside of its existing business domain, new competencies in searching out and seizing new business opportunities, markets or technologies. The notion of ambidexterity, as the prefix denotes, is underpinned by the “both”, which, in relation to a firm, can refer to any kind of contending duality, whether with regard to domain, solution, or otherwise. The mainstream research primarily focuses on implementing ambidexterity across organizations so as to attain both “exploitation” and “exploration” (O’Reilly III and Tushman, 2013). Exploitation is characterized by certainty, maturity, refinement, production, low variation, control, and looking at close-range goals, whereas exploration is expressed with innovation, flexibility,

risk, variation, and looking beyond the immediate horizon into a global search for goals (March, 1991).

That there are inherent tensions between exploitation and exploration has been well recognized. Some scholars have noted the incompatibilities between exploration and exploitation, and the problem of bounded rationality arising from the differences in their domains and goals (Levinthal and March, 1993; March, 1991); others have noted that, to be ambidextrous, firms have to make trade-offs between short- and long-term demands by allocating scarce resources among competing priorities depending on multiple criteria (Burkinshaw and Gupta, 2013).

Alternatively, certain case studies have reported that by maintaining a balance between exploration and exploitation, the tensions between them can be made complementary (Chen and Katila, 2008; Gilbert, 2005; Goosen, Bazzazian, and Phelps, 2012; Laplume and Dass, 2012; Raisch, 2008; Sirmon *et al*., 2011; Wassmer, Li, and Madhok, 2017). Success at ambidexterity has been attributed to, among other things, managerial capabilities in managing conflicts (Raisch and Birkinshaw, 2008) and in leadership (in particular, O'Reilly III, and Tushman, 2013).

Ambidexterity and strategic choices: Chandler (1962: 13) defined strategy as "*the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals*". These new basic goals cover both short-term decisions, such as the expansion of existing activities and acquisition of new plants and equipment, and long-term decisions, such as moving to new economic functions or adopting more diversified lines of business. Firms have a number of strategic choices that they can adopt to achieve growth (Child, 1972; 1994), but the trade-off between efficiency and flexibility is a well-known paradox of administration (Thompson, 1967). As already noted, ambidextrous firms are asked to make trade-offs between short- and long-term demands and to allocate scarce resources among competing priorities depending on multiple criteria (Birkinshaw and Gupta, 2013). This relationship, between ambidexterity and strategic choices among conflicting goals, leads to the first two propositions as follows:

Proposition 1: The choice of strategic resource allocations determines the

exploration-exploitation combination of the firm.

Proposition 2: The strategic choices of the exploration-exploitation combination affect long-term and short-term performance.

Resources, ambidexterity, and dynamic capabilities: Strategy-making is an iterative process of resource allocation (Noda and Bower 1996). The resource-based view perceives a firm as "*a unique bundle of idiosyncratic resources and capabilities*", the management of which demands two simultaneous tasks: working both "*to maximize value through the optimal deployment of existing resources and capabilities*" and on "*developing the firm's resource base for the future*" (Grant, 1996). Firms manage resources following given processes, one of which is bundling resources to formulate incremental and pioneering capabilities and leveraging them in a capability configuration (Sirmon, Hitt, and Ireland, 2007, Sirmon *et al*., 2011). To achieve sustainability, firms not only have to possess the operational capabilities and competencies to compete in existing markets, but also have to build up the ability to recombine and reconfigure assets and organizational structures to adapt to the emerging business environment (O'Reilly III and Tushman, 2007).

Dynamic capability draws attention to the firm's ability to reconfigure resources to sustain superior performance in a changing environment (Teece, Pisano, and Shuen, 1997). For the sustained success of their firm, the key responsibility for managers is not only to allocate resources to various functions (Noda and Bower, 1996; Sridhar, Narayanan, and Srinivasan, 2014), but also to make decisions and put in place routines that can sense and seize new opportunities through the reallocation of organizational assets (O'Reilly III and Tushman, 2013). Given limited resources, there is a potential trade-off between exploration and exploitation strategies, which makes it challenging for a firm to balance the two and ensure short-term viability and long-term sustainability simultaneously (Levinthal and March, 1993; March, 1991).

Proposition 3: The choices of strategic resource allocations have direct effects on long-term and short-term performance.

Proposition 4: The choices of strategic resource allocations have indirect effects on long-term and short-term performance through the exploration-exploitation combination.

3. The research framework

Choices about how much to invest in different areas are central to a firm's strategy (Dierickx and Cool, 1989). Considering data availability, this paper takes the viewpoint of structural ambidexterity to examine the employment of resources in firms implementing ambidexterity, the inter-relations between exploitation and exploration, and their relations to performance. In this regard, exploitation is operatively defined as marketing and exploration as research and development (R&D), separately carried out by two functional units in a firm.

Resource deployments between R&D and marketing are measured by the respective shares of their expenditure to total sales. Long-term and short-term performance are respectively measured by Tobin's q, a common indicator to signify the long-term growth opportunity of a firm, and return on equity (ROE), a performance indicator critical to shareholders. Data from the computer-based services industry, collected from the Compustat North America database for the period 2004 to 2014, were used to test the model. The rationales for this approach are as follows. First, although resource competition may arise within individual functional units including marketing (Kyriakopoulos and Moorman, 2004) and R&D (Namara and Baden-Fuller, 2007), it also exists between functional units for annual budgeting (Sridhar, Narayanan, and Srinivasan, 2014) and for the power to influence innovation (O'Connell, 2014). Specifically, there are trade-offs between exploring in R&D functions versus exploiting in marketing functions (Lavie and Rosenkopf, 2006). R&D and marketing are considered the appropriate measures to approximate exploration and exploitation (Stock and Reiferscheid, 2014).

Second, departing from previous studies that have used subjective measurements for ambidexterity, this paper estimated exploration and exploitation with financial variables. The managerial decisions on resource employment, the ambidexterity capabilities, and their impacts on performance cannot be comprehended or imitated by outsiders due to ambiguity among complicated resource bundles and the causal relations between inputs and outputs (Reed and DeFillippi, 1990; Rivkin, 2001). Accounting statements record the outcome of how resources are distributed to functional units to recruit

human resources or to acquire external services. These records manifest the realization of management strategies and the real actions of the individual units that generate the performance (Tang and Liou, 2010). The dynamic paradigm of ambidexterity, between exploitation and exploration for long-term survival and response to environmental changes, refers to a long-term trajectory of organizational activities and performance. The financial measuring approach allows us to trace with longitudinal data the variations in resource allocation/reallocation and the corresponding firm performance.

Similar to Tushman and O'Reilly's (1996) work emphasizing structural separation between two different types of activities, this paper focuses on one single aspect of ambidexterity from the perspective of the managerial deployment of resources to research and development (R&D) vis-a-vis marketing. Firms make R&D and marketing expenditures with the objective of generating value for shareholders (Sirmon, Hitt, and Ireland, 2007). Notwithstanding that both R&D and marketing bear the responsibility to generate current profits and enhance future growth simultaneously, marketing usually represents a significant part of the exploitation of existing assets of a firm, with relative certainty of proven benefits (Stock and Reiferscheid, 2014), whereas R&D represents the explorative aspect with a view to securing new, uncertain business opportunities over a longer period of time (Mudambi and Swift, 2014). There has been an on-going debate as to which of R&D or marketing functions should be more greatly empowered to achieve management objectives, e.g. new-product development, (O'Connell, 2014). Essentially, given scarce resources, there is an inherent tension between marketing and R&D. A senior manager must decide how to go about the allocation of resources to and between two different types of activity that are both seen as essential to the firm's immediate profitability and long-term sustainability. The model presents the linkage from resource employments between R&D and marketing to firm performance through capacity building in the mixture of exploration and exploitation.

4. Empirical study

4.1 Variables

Financial items represent the ultimate outcomes of business strategy and associated operational activities (Tang and Liou, 2010). This paper uses financial variables to measure firms' resource deployments, their exploration and exploitation configuration, and their long-term and short-term performance.

Resource deployment. In addition to the direct costs of production, firms allocate resources to technological development and marketing to create value-added for current and potential customers and to capture opportunities to meet future needs. To measure resource employments or capabilities, R&D expenditure is a good proxy of the R&D behavior of firms (Hall, Griliches, and Hausman, 1984). While spending on technological development is recorded in R&D expenditure, it is not as easy to identify marketing expenses since the advertising and sales force spending are included in the selling, general and administrative expenses (SG&A) R&D, which, according to Compustat's definition, consists of marketing expenses, advertising expenses, R&D expenses, commissions and other administrative expenses. However, SG&A expenses minus R&D expenditure is commonly used as a proxy for marketing spending (e.g., Kim and McAlister, 2011; Kurt and Hulland, 2013; Luo, 2008; Mizik and Jacobson, 2007). This paper uses SG&A minus R&D expenditure to denote the marketing-related expenses (for simplicity this calculated value is denoted as SG&A throughout the remainder of the paper). Resource deployments are measured by the percentage share of R&D and SG&A expenditure to total revenues (sales) and are denoted as *rd* $(=\frac{R\&D}{Sales})$and *m* $(=\frac{SG\&A}{Sales})$ respectively.

Exploration and exploitation. Ambidextrous firms are able to pursue long-term and short-term objectives simultaneously. We define the long-term objective of the firm as the maximization of shareholder wealth, which is estimated by the market value of equity. Alternatively, the short-term objective is to increase net income, which is the yearly profit generated to shareholders netted off against expenses and taxes. Exploration (EPR) is defined as the ability to create the market value (MV) of equity, while exploitation (EPI) is defined as

the ability to generate yearly net income (NI) from the employments of R&D and marketing resources simultaneously (Equation (1) and (2)).

$$EPR = \frac{MV}{(R\ \&\ D + SG\ \&\ A)} \tag{1}$$

$$EPI = \frac{NI}{(R\ \&\ D + SG\ \&\ A)} \tag{2}$$

Performance. We test two ratio variables to indicate performance. The first is Tobin's q (denoted as Q), a popular indicator used to measure the future growth opportunity of a firm. Q is approximated by the ratio of market value over book value ($Q = \frac{MV}{BV}$). The second indicator is return on equity (ROE), which is a commonly used short-term performance indicator critical to shareholders. ROE is measured by net income divided by total equity ($ROE = \frac{NI}{Equity} \times 100$).

4.2 Data source and sample

Our sample consists of computer-based services companies. We collected data on these firms from the Compustat North American database, identifying them by standard industrial classification (SIC) code 737x, which includes 7370 (computer programming and data process), 7371 (computer programming services), 7372 (prepackaged software), 7373 (computer integrated system design), 7374 (computer processing and data preparation services) and 7377 (computer rental and leasing). Computer-based services industry is a young and dynamic industry that has enjoyed high growth over the last decade, with a great many firms entering the market and disappearing (dying or being acquired by other firms) in the space of a few years. The data was collected from 2004, the year of Google's initial public offering, to 2014. There were 632 eligible companies in the Compustat database in 2004, increasing to 661 in 2013, and dropping to 529 in 2014. This period covers industry business cycles including the one driven by the financial crisis of 2007-2008.

4.3 The Modeling procedure

We used the EViews 7.0 package to perform panel regression models for the sample data. Barnes (1986) pointed out that for statistical testing the residual of financial ratios is typically cross-sectional heteroskedastic, which may yield biased standard error estimation with an ordinary least square approach. Therefore, we estimated general least squared (GLS) models with cross-section weights assuming the presence of cross-section heteroscedasticity to correct estimation errors. Another property of financial ratios is the existence of autocorrelation in the time-series data. We first tried an autoregressive (AR) model to remove the autocorrelation problem in the residuals. Wherever the autocorrelation problem could not be removed by the AR model, the first-order differential AR models were used. The results are summarized in Figure 1, Table 1, and Table 2.

4.4 Test ambidexterity as the mediator

The mediation effects were tested in three steps (Baron and Kenny, 1986; Kenny, Kashy, and Bolger, 1998; Mackinnon and Dwyer, 1993) as follows. The first step was to demonstrate that the independent variables (in this case, resource deployment measured by the ratios of R&D expenditure and marketing related expenses to total revenues) influence the dependent variable (performance). The second step was to establish that the independent variables influence each of the mediators (in this case, exploitation and exploration). The final step was to demonstrate that the mediators (exploitation and exploration) influence the dependent variable, with the independent variables (marketing and R&D resource deployments) controlled. If, in this final step, the effects of resource employments on performance turn out to be insignificant, full mediation is indicated (Baron and Kenny, 1986; Kenny, Kashy, and Bolger, 1998); partial mediation is presented otherwise.

This study consists of two mediators, exploration and exploitation, of resource deployments on performance. In the view that the effect of one mediator may change in the presence of the other, we built a full model to estimate these two mediators (MacKinnon and Dwyer, 1993). This approach is consistent with the pretext of ambidexterity: that exploration and exploitation operate simultaneously to affect performance.

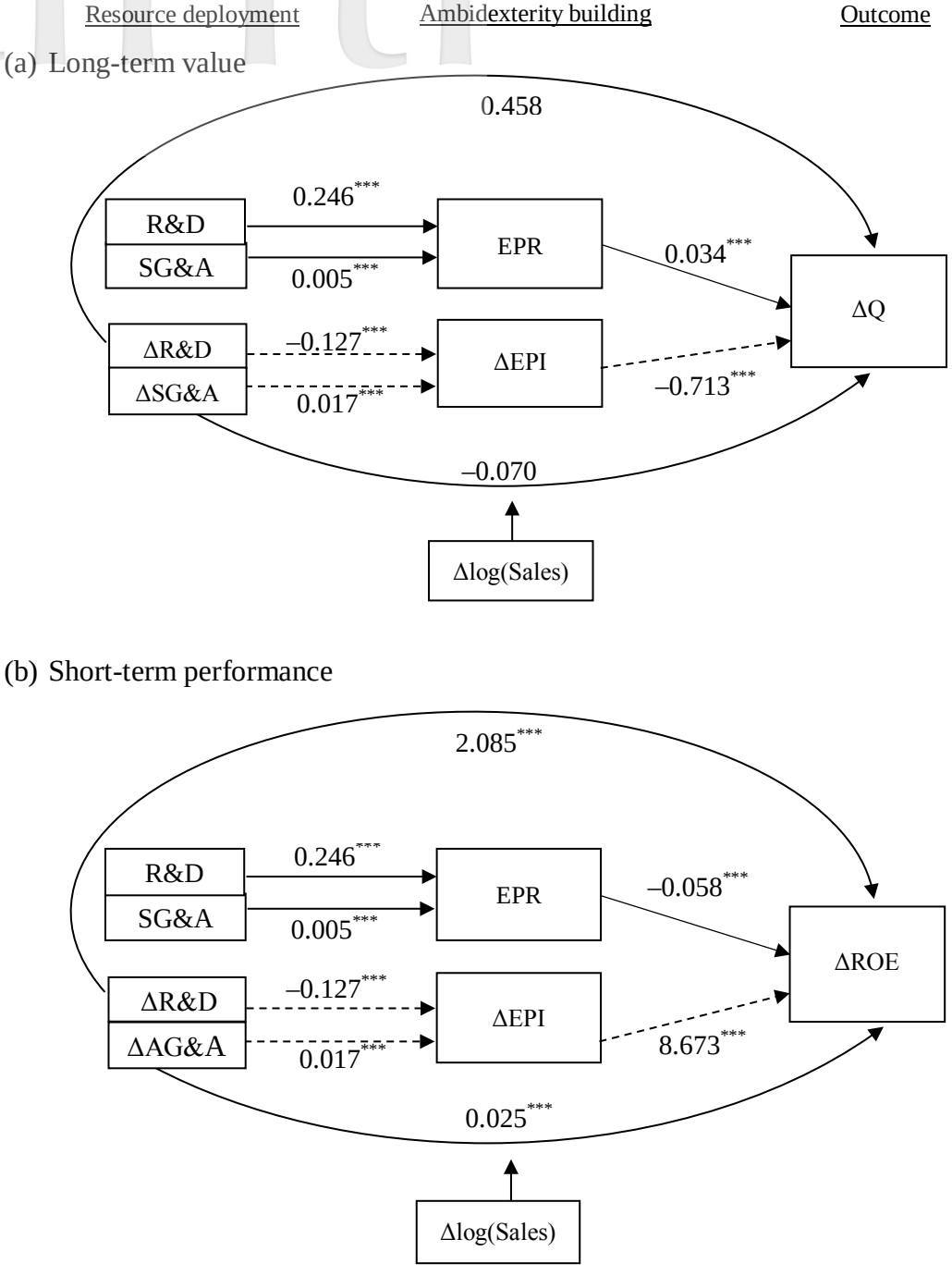

Figure 1
The results of model testing

Table 1
Testing the Mediating Effects of Ambidexterity on Long-term Performance

Model: Differentiation
Method: Panel estimated GLS (Cross-section weights)

Dependent Variables	Model 1	Model 2-1	Model 2-2	Model 3
	Δ*Q*	*EPR*	Δ*EPI*	Δ*Q*
R&D/TR (rd)		0.246***		
SG&A/TR (m)		0.005***		
Log(Sales)		0.744***		
rd differential (Δ*rd*)	3.630***		–0.127***	0.458
SG&A differential (Δ*m*)	–0.378***		0.017***	–0.070
Exploration (*EPR*)				0.034***
Exploitation differential (Δ*EPI*)				–0.713***
Sales differential (Δlog(*Sales*)	–1.484***		0.328***	–0.950***
AR(n)	[a]–0.053***	[b]0.704***	[a]0.154***	[a]–0.019*
R square	0.17	0.99	0.20	0.76
DW statistics	1.97	1.95	2.13	1.86
Cross-section	341	639	441	341
Observation	1436	3066	1850	1436

****P<0.001; ***P<0.01; *p<0.05*; [a]AR(3); [b]AR(1)

Table 2
Testing the Mediating Effects of Ambidexterity on Short-term Performance

Model: Differentiation
Method: Panel estimated GLS (Cross-section weights)

Dependent Variables	Model 4-1	Model 4-2
	Δ*ROE*	Δ*ROE*
Intercept	–0.060	–6.765***
rd differential (Δ*rd*)	–0.071*	19.509***
M differential (Δ*m*)	0.007*	–1.974***
EPR		0.124**
EPI differential (Δ*EPI*)		25.591***
Δlog(*Sales*)	0.070***	37.354***
AR(2)	0.001***	–0.011***
R square	0.08	0.41
DW statistics	2.05	2.06
Cross-section	373	308
Observation	1408	1177

****P<0.001*; ***P<0.01*; ****P<0.05.*

All models include the natural logarithm of total sales to control the effect of scale on performance. The model fits are given in Table 1 for long-term performance and in Table 2 for short-term performance. The Durbin-Watson values (DW) in all models show no indication of positive or negative autocorrelation of the residuals.

Model 1 shows that the effects of an increase in R&D resource deployment (Δrd) on the increase in long-term performance (ΔQ) are significantly positive (3.63^{***}), but those of the increase in marketing resource deployment (Δm) are significantly negative (-0.378^{***}). Model 2-1 shows that deployments of both R&D (*rd*) and marketing (*m*) resources have significant and positive effects (0.246^{***}, 0.005^{***}) on exploration (*EPR*). Model 2-2 shows that an increase in R&D deployments (Δrd) has negative effects (-0.127^{***}) on increase in exploitation, while an increase in marketing deployments (Δm) has positive effects (0.017^{***}) on the same. The R^2 of Model 2 is high (0.99), but the Dickey-Fuller tests rejected the hypothesis of unit root.

Model 3 shows that both exploration (*EPR*) and increase in exploitation (ΔEPI) have significant impacts on the increase in Tobin's q (ΔQ), with the impact being positive (0.034^{***}) for the former and negative for the latter ($-.713^{***}$). In addition, given that exploration and exploitation are incorporated in the model, an increase in R&D and marketing deployments becomes insignificant.

Models 4-1 and 4-2, together with Models 2-1 and 2-2, examine the mediation effects of exploration and exploitation on the relationship between resource deployments and ROE. Model 4-1 shows that the increase in R&D and marketing resource deployments has significant effects on the change of ROE ($-.071^{*}$, 0.007^{*}). Model 4-2 shows that both exploration and increase in exploitation positively affect the change of ROE (0.124^{***}, 25.591^{***}). Furthermore, incorporating the mediators changed the effects of an increase in the deployment of R&D resources on performance from negative (-0.071^{*}) to positive (19.509^{***}), and changed the effects of an increase in the deployment of marketing resources on performance from positive (0.007^{***}) to negative ($-.974^{***}$). These results signify suppression effects, by which the direct and mediated effects of an independent variable on a dependent variable have opposite signs (Tzelgov and Henrik, 1991).

4.5 The complementary effect of exploration and exploitation on performance

Table 3 shows the mediation effects of the interaction between exploration and exploitation on the relationship between resource deployments and performance. Models 5-1 and 5-2 show that the interaction between exploration and exploitation has positive effects on both Tobin's q (0.24^{***}) and ROE (0.643^{***}). With the inclusion of the interactive term, the direct effects of an increase in R&D (4.659^{***}) and marketing (-0.480^{***}) resources remain significant. These mediators show suppression effects since the impacts of both an increase in R&D and in marketing resources on Tobin's q are higher than the impacts in Model 1 (4.659>3.630; 0.480>0.378).

These mediators also signify suppression effects as, like in Model 3-2, the impacts of both an increase in R&D and marketing shares on ROE have opposite signs.

Table 3
Testing the Interactive effects of Exploration and Exploitation on the Resource-Performance relationship

Model: Differentiation
Method: Panel estimated GLS (Cross-section weights)

Dependent Variables	Model 5-1	Model 5-2
	ΔQ	ΔROE
Intercept		-6.762^{***}
rd differential (Δrd)	4.659^{***}	22.859^{***}
M differential (Δm)	-0.480^{***}	-2.248^{***}
EPR	0.038^{***}	0.162^{***}
EPI differential (ΔEPI)	-1.883^{***}	31.95^{***}
EPR x ΔEPI	0.240^{***}	0.643^{***}
Δlog(*Sales*)	-2.578^{***}	40.120^{***}
AR(n)	[a] -0.047^{***}	[b] -0.012^{***}
R square	0.78	0.57
DW statistics	2.00	2.06
Cross-section	341	452
Observation	1436	2007

$^{***}P<0.001$; $^{**}P<0.01$; $^{***}P<0.05$; [a]AR(3); [b]AR(2)

5. Discussion

The propositions that the ambidexterity of exploration and exploitation mediates the effects of resource deployments on short-term performance and long-term growth were supported by the data collected from the computer-services industry in this paper. The implications of the results of the empirical study for the computer-based services industry are discussed below.

The relationship of resource deployments to exploration and exploitation. Both R&D and marketing resources affect exploration and exploitation simultaneously, but the effects differ. While resource deployments straightforwardly affect exploration, the effect of the deployment of resources on exploitation follows a different pattern. In addition, the employment of marketing resources positively affects exploration and exploitation, as expected. However, the employment of R&D resources improves exploration but deteriorates exploitation. This result draws out the first trade-off issue: that allocating resources to R&D activities to enhance exploration may come at the cost of lowering exploitation.

Direct effects of resource employments on performance given exploration and exploitation as the mediators. Exploration and exploitation fully mediate the effects of resource deployments on long-term performance. The direct effects of resource deployments on long-term performance are insignificant.

Unlike their effects on long-term performance, exploration and exploitation have only partial mediating effects on the influence of resource employments on short-term performance. The direct effect of marketing resource employments on short-term performance is negative, which is not surprising given that marketing spending is treated as an expense that is deducted from the annual net income. However, despite the fact that R&D expenditure is also excluded from net income, the direct effect of R&D resource employments on short-term performance is positive. This result may reflect a demand-side increasing return (Boulding and Staelin, 1995) associated with the computer-based service firms' ability to take advantage of the R&D investment.

Indirect effects of resource employments on performance via exploration and exploitation. As shown in Panel A of Table 4, the indirect effects of resource

employments of R&D and marketing via exploration increased the long-term growth opportunity (0.009) as well as short-term performance (0.031), as expected. This result indicates the presence of complementary or orchestrated resource utilization in strengthening exploration for long-term performance. However, while the indirect effect of resource employments on long-term growth via exploitation is positive (0.078), the effect on short-term performance is negative (–2.805). In short, long-term growth opportunity is positively associated with exploration but is negatively related to exploitation. This result signifies a second trade-off issue: that allocating resources to build exploitation may come at the cost of lowering long-term growth.

The indirect effects via ambidexterity between individual resource and performance. Panel B of Table 4 shows that the indirect effect of an increase in R&D resources on long-term performance via ambidexterity is positive (0.094), but the effect on short-term performance is negative (–3.044). This is the case because ambidexterity is intrinsically inefficient in the short-term owing to the

Table 4
Total Indirect Effects of Resource Deployments/Employments on Performance

Resource employment	*EPR*/*EPI*	ΔQ	ΔROE
Panel A: Indirect effects of resource deployments on performance			
rd	*EPR*	0.008	0.030
m		0.000	0.001
Sub-total (a)		**0.009**	**0.031**
Δrd	ΔEPI	0.086	–3.075
Δm		–0.008	0.270
Sub-total (b)		**0.078**	**–2.805**
Total indirect effects (=a+b)		0.087	–2.774
Panel B: Indirect effects of the employment of individual resource on performance			
rd	*EPR*	0.008	0.030
Δrd	ΔEPI	0.086	-3.075
	Sub-total (c)	**0.094**	**–3.044**
m	*EPR*	0.000	0.001
Δm	ΔEPI	–0.008	0.270
	Sub-total (d)	**–0.007**	**0.270**
Total indirect effects (=c+d)		0.087	–2.774

duplication of effort and the expenditure of resources on innovation, not all of which will be successful. Contrarily, the effects of an increase in marketing resources on long-term performance via ambidexterity is negative (–0.007), while the effect on short-term performance is positive (0.270). These results indicate the third trade-off issue: that, whichever of long-term growth or short-term performance the firm chooses to prioritize, it may come at the cost of lowering the other.

Finally, the positive interactive effect of exploration and exploitation on performance present the orchestration of ambidexterity (Hodgkinson, Ravishankar, and Aitken-Fischer, 2014; Luo, Luo, and Zhang, 2016) given the three trade-off effects along the path of resource deployment, exploration/exploitation, and performance.

6. Conclusions

This paper showed the dual process of ambidexterity, from resource allocation through capacity configuration to performance, along short- and long-term paths and via three trade-offs: (1) the allocation of scarce resources between R&D and marketing activities (Lavie and Rosenkopf, 2006), (2) the balance of exploration and exploitation (Ancona *et al*., 2001; Burgelman, 1991; Floyd and Lane, 2000; Levinthal and March, 1993), and (3) the choice between long-term growth and short-term performance. From these three trade-offs, we found, on the one hand, that the employment of R&D resources strengthened exploration but discouraged exploitation and subsequently reduced short-term performance. On the other hand, the employment of marketing resources enhanced exploitation but decreased the opportunity for long-term growth.

These results indicate a cyclical process of dynamic capability with ambidexterity configuration at the core. Managers first set objectives for short-term performance and long-term growth, with these objectives giving guidance on how many resources are to be allocated to activities related to short- and long-term performance. These resource allocations frame the relative weight of exploration and exploitation in the ambidexterity configuration, and therefore the outcome in subsequent short- and long-term performance. If, due to environmental changes, the realized or expected performance is inconsistent with

managerial objectives, efficient managers will reallocate the resources and ambidexterity will be reconfigured accordingly. Ultimately, the strategic choice between long-term growth and short-term performance determine the resource allocation and the subsequent exploration-exploitation configuration. Any choice made in the cyclical decision process has the potential to result in unexpectedly poor performance or even failure.

The constraints of this paper are mainly associated with data availability. The proxy variables R&D and SG&A are expense items on accounting books, which do not include intangible resources and might underestimate the resources actually employed. In addition, SG&A may be less than precise as a measure of the employment of marketing resources because it includes non-marketing expenses. Composite variables may be used to measure the concept of exploration and exploitation if longitudinal data is available for future research.

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